Work Order ID 113513

February-19-14 12:59:35 PM

113513

Item ID: D412-664-203 **Accept** *N900040100* **Setup Start** *NS1*

Revision ID: **Stop** *NS2*

Item Name: Aft Crosstube - High

Start Date: 2/19/14 **Start Qty:** 1.00 *1*

Required Date: 3/05/14 **Req'd Qty:** 1.00 *1*

Reference:

Cust Item ID:

Customer:

Run Start *NR1*

Stop *NR2*

Approvals: **Process Plan:** ML5 **Date:** 14-02-19 **Tooling:** **Date:**

QC: **Date:** **SPC (Y/N):** **Date:**

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
Draw Nbr	**Revision Nbr**								
D412-664-243	E/DEO								
100		0.00							
100	DOCUMENT CONTROL								
DC	**Memo**	0.00							
Doc.Control -USB or Paperwork	Photocopy bluefile and create labels as per PPP D412-664-203 CHG 009								
110		0.00							
110	Packaging								
Packaging	**Memo**	0.00							
Packaging									
120		0.00							
120	BENDING MACHINE - CROSSTUBES								
CNC Bend 2	**Memo**	0.00							
CNC Alpha 160 Bender	Bend tube as per Dwg D412-664-243 using CNC bender program 412-aft and Folio FT010								

DAS 31 9-89 14-03-18 1

MD 14/02/19

MD 14/02/24

SEE Attached SHEET

Pb → Last Page

Item ID: D412-664-203 **Accept** *N900040100* **Setup Start** *NS1*
Revision ID: **Stop** *NS2*
Item Name: Aft Crosstube - High

Start Date: 2/19/14 **Start Qty:** 1.00 *1*
Required Date: 3/05/14 **Req'd Qty:** 1.00 *1*
Reference:

Cust Item ID:
Customer:

Run Start *NR1*
Stop *NR2*

Approvals: **Process Plan:** **Date:** **Tooling:** **Date:**
QC: **Date:** **SPC (Y/N):** **Date:**

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
130	QC15- Crosstube Dimensional Check	0.00	DAS 27 9-89 14/2/24	/	DAS 16 9-89 14/02/25				
130									
QC	**Memo**	0.00							
Quality Control									
140		0.00							
140	Crosstubes								
Crosstubes	**Memo**	0.00							
Crosstubes	1-Drill pilot holes in tube as per Dwg D412-664-243 using drill Jig DT8550 & DT8551and drill table DT8577 using #9 holes as per QSI 10 to install towers.								
	2-Ream hole to finish size in tube as per Dwg D412-664-243using drill Jig DT8550 & DT8551.Check dimensions between holes, both sides on both cuffs, to ensure alignment with saddle holes.								
	3-SCRIBE PART # & BATCH #								
	4- *** WEAR LATEX GLOVES WHEN HANDLING CROSSTUBE*** Deburr & Inspect for surface damage. Repair damage within limits as per Dwg D412-664-243								

MO 14/02/26

GB 14-02-26

Work Order ID 113513

113513

February-19-14 12:59:35 PM

Item ID: D412-664-203 **Accept** *N900040100* **Setup Start** *NS1*

Revision ID: **Stop** *NS2*

Item Name: Aft Crosstube - High

Start Date: 2/19/14 **Start Qty:** 1.00 *1* **Cust Item ID:**

Required Date: 3/05/14 **Req'd Qty:** 1.00 *1* **Customer:**

Reference:

Run Start *NR1*

Approvals: **Process Plan:** **Date:** **Tooling:** **Date:** **Stop** *NR2*

QC: **Date:** **SPC (Y/N):** **Date:**

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
160	QC5- Inspect part completeness to step on W/O	0.00							
160									
QC	**Memo**	0.00							
Quality Control	*** WEAR LATEX GLOVES WHEN HANDLING CROSSTUBE***								
170		0.00							
170									
HandFXtube	**Memo**	0.00							
Hand Finishing Crosstubes	*** WEAR LATEX GLOVES WHEN HANDLING CROSSTUBE***								
	1- CLEAN CROSSTUBE WITH WASH'N WIPE								
180	Outsource process - NDT per QSI038 4.1	0.00							
180									
Outsource2	**Memo**	0.00							
Outsource process - NDT	*** WEAR LATEX GLOVES WHEN HANDLING CROSSTUBE***								
	Liquid Penetrant Inspection as per QSI 038Or Issue P/O: 23259 LPI as per ASTM 1417 Level 2 Attach copy of NDT results to work order								

DAS 27 9-89 14/2/27

1 CR 14-03-06

CR 14/03/06 ①

Work Order ID 113513

113513

February-19-14 12:59:35 PM

Item ID: D412-664-203 **Accept** *N900040100* **Setup Start** *NS1*

Revision ID: **Stop** *NS2*

Item Name: Aft Crosstube - High

Start Date: 2/19/14 **Start Qty:** 1.00 *1* **Cust Item ID:**

Required Date: 3/05/14 **Req'd Qty:** 1.00 *1* **Customer:**

Reference:

Run Start *NR1*

Approvals: **Process Plan:** **Date:** **Tooling:** **Date:**

Stop *NR2*

QC: **Date:** **SPC (Y/N):** **Date:**

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
190		0.00							
190	Packaging								
Packaging	**Memo**	0.00							
Packaging	*** WEAR LATEX GLOVES WHEN HANDLING CROSSTUBE***								
	Inspect for transit damage								
	Ensure copy of NDT results attached to work order.								
200	QC5- Inspect part completeness to step on W/O	0.00							
200									
QC	**Memo**	0.00							
Quality Control	*** WEAR LATEX GLOVES WHEN HANDLING CROSSTUBE***								
	Inspect for damage & ensure results are as per Dwg D412-664-203								
203		0.00							
203									
HandFXtube	**Memo**	0.00							
Hand Finishing Crosstubes	*** WEAR LATEX GLOVES WHEN HANDLING CROSSTUBE***								
	1- PRESSURE WASH AND THEN USE WASH'N WIPE TO CLEAN CROSSTUBE BEFORE CHEMICAL CONVERSION								

DAS 27 9-89

14/3/6

14-03-06

Work Order ID 113513

February-19-14 12:59:35 PM

113513

Item ID: D412-664-203 **Accept** *N900040100* **Setup Start** *NS1*

Revision ID: **Stop** *NS2*

Item Name: Aft Crosstube - High

Start Date: 2/19/14 **Start Qty:** 1.00 *1* **Cust Item ID:**

Required Date: 3/05/14 **Req'd Qty:** 1.00 *1* **Customer:**

Reference:

Run Start *NR1*

Approvals: **Process Plan:** **Date:** **Tooling:** **Date:**

Stop *NR2*

QC: **Date:** **SPC (Y/N):** **Date:**

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
205	QC7-Inspect Chemical Conversion Coat	0.00							
205						1	ø	ø	AB 14-3-9
QC	**Memo**	0.00							
Quality Control	*** WEAR LATEX GLOVES WHEN HANDLING CROSSTUBE***								

Item ID: D412-664-203
Revision ID:
Item Name: Aft Crosstube - High

Start Date: 2/19/14 **Start Qty:** 1.00 *1*
Required Date: 3/05/14 **Req'd Qty:** 1.00 *1*
Reference:

Accept *N900040100*

Setup Start *NS1*
Stop *NS2*

Cust Item ID:
Customer:

Run Start *NR1*
Stop *NR2*

Approvals: **Process Plan:** **Date:** **Tooling:** **Date:**
QC: **Date:** **SPC (Y/N):** **Date:**

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
210		0.00							
210	SprayPaint					1	Ø	Ø	AS 14-3-10
SprayPaint	**Memo**	0.00							

Spray Painting

*** WEAR LATEX GLOVES WHEN HANDLING CROSSTUBE***

Mask underside of crosstube as shown

1-Prime inside and outside crosstube as per QSI 005 4.2

2-Paint outside crosstube with White Imron as per DEO D412-664-243 and QSI 005 4.2

PRIME: 128049
Start Time: 2:00
Fininsh Time: 2:45
PAINT: 127762
Start Time: 6:30
Finish Time: 7:30

3- Apply clear coat after paint as per DEO
125473

Work Order ID 113513

113513

February-19-14 12:59:35 PM

Item ID: D412-664-203 **Accept** *N900040100* **Setup Start** *NS1*

Revision ID: **Stop** *NS2*

Item Name: Aft Crosstube - High

Start Date: 2/19/14 **Start Qty:** 1.00 *1*

Required Date: 3/05/14 **Req'd Qty:** 1.00 *1*

Reference:

Cust Item ID:

Customer:

Run Start *NR1*

Stop *NR2*

Approvals: **Process Plan:** **Date:** **Tooling:** **Date:**

QC: **Date:** **SPC (Y/N):** **Date:**

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
220	QC14- Inspect Spray Paint	0.00							
220									
QC	**Memo**	0.00							
Quality Control	Then,Wrap in plastic bag to protect from scratches								

DAS 16 9-89 14/03/11

230 0.00

230 Crosstubes

Crosstubes **Memo** 0.00

Crosstubes Assemble as per Dwg D412-664-203

1- Install chafing shield as per DEO D412-664-243.Top holes should be facing up.

A/R Proseal 890 Batch: 127662

EXP: 4/14

2- Lightly scuff the bonded area using a 320 grit sand paper and clean the area with 41058 wash 'n' wipe

3-Install support with Scotch-Weld DP460 and install clamps as per DEO Dwg D12-664-243 using installaition jig DT9024. Torque clamps as per dwg

A/R Scotch-Weld DP460 Batch: M12660J

EXP: 7/14

1 CR 14-03-12

Work Order ID 113513

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113513

Item ID: D412-664-203 **Accept** *N900040100* **Setup Start** *NS1*
Revision ID: **Stop** *NS2*
Item Name: Aft Crosstube - High

Start Date: 2/19/14 **Start Qty:** 1.00 *1*
Required Date: 3/05/14 **Req'd Qty:** 1.00 *1*
Reference:

Cust Item ID:
Customer:

Run Start *NR1*
Stop *NR2*

Approvals: **Process Plan:** **Date:** **Tooling:** **Date:**
QC: **Date:** **SPC (Y/N):** **Date:**

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
240	QC5- Inspect part completeness to step on W/O	0.00							
240									
QC	**Memo**	0.00							
Quality Control	***RE-CHECK TORCQUE ON CLAMP AFTER PROSEAL HAS CURED FOR 24HOURS AS PER DWG.***								
250	Pick Kit	0.00							
250									
Packaging	**Memo**	0.00							
Packaging									
260	QC4- 100% Inspect kits for completeness	0.00							
260									
QC	**Memo**	0.00							
Quality Control									

DAS 16 9-89 14/03/17

DAS 32 9-89 14/3/18

DAS 31 9-89 14-03-18

Item ID: D412-664-203 **Accept** *N900040100* **Setup Start** *NS1*
Revision ID: **Stop** *NS2*
Item Name: Aft Crosstube - High

Start Date: 2/19/14 **Start Qty:** 1.00 *1*
Required Date: 3/05/14 **Req'd Qty:** 1.00 *1*
Reference:

Cust Item ID:
Customer:

Run Start *NR1*
Stop *NR2*

Approvals: **Process Plan:** **Date:** **Tooling:** **Date:**
QC: **Date:** **SPC (Y/N):** **Date:**

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
270		0.00							
270	Packaging								
Packaging	**Memo**	0.00							
Packaging	Identify and pack for shipping as per PPP D412-664-203 ******Ensure tube is not packaged if curing time is less than 12 hrs, see step 27 for application time & date ******* Time & date of packaging:_____ Location: 103								
280	QC21- Final Inspection - Work Order Release	0.00							
280									
QC	**Memo**	0.00							
Quality Control									

MAR 18 2014 DAS 06 9-89

RL 14-03-19

MF 14-3-19

Picklist Print

February-19-14 12:59:40 PM

Work Order ID: 113513 *113513*

Parent Item: D412-664-203 *D412-664-203*

Parent Item Name: Aft Crosstube - High

Start Date: 2/19/14 **Required Date:** 3/05/14

Start Qty: 1.00 **Required Qty:** 1.00

Comments: IPP Rev:E04.02.16Reformat; Added D3189-1K/DS
IPP Rev:F 06-03-29 Remove Coments on Pick List JLM
IPP Rev:G 06.12.08 per ECN 886 EC
IPP Rev:H 07-04-30 As per Rev D JLM
IPP Rev:I 08-06-12 add comment in seq. 21 DD verified by:EC IPP rev J
11.04.21 DEO D412-664-243-E-1 EC verified DD IPP REV:K
11.10.03 DEO D412-664-243-E-2 DD verf:EC

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D412-664-203TRN		Manufactured	No			110	Each	3.0000	1	1			
D412-664-203TRN									**				
Crosstube Turning Detail													

Location	Loc Qty	Loc Code	
LG014	3		
108675	1		
108676	1		
108678	1		1

D2896-1		Manufactured	No			230	Each	27.0000	1	1			
D2896-1									**				
Support													

MO 14/02/19

CR 14/03/12

Location	Loc Qty	Loc Code	
LG053	27		
103376	7		1
108280	20		

D3189-1		Manufactured	No			230	Each	24.0000	2	2			
D3189-1									**				
Chaffing Shield													

CR 14/03/12

Location	Loc Qty	Loc Code	
FG	4		
36065	4		
LG053	20		
111766	20		2

Picklist Print

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Work Order ID: 113513 *113513*

Parent Item: D412-664-203 *D412-664-203*

Parent Item Name: Aft Crosstube - High

Start Date: 2/19/14 **Required Date:** 3/05/14

Start Qty: 1.00 **Required Qty:** 1.00

D3595-063-570	Manufactured	No		230	Each	50.0000	2	2
D3595-063-570						**		CR 14-03-12
Rubber Cushion								

Location	Loc Qty	Loc Code	
FG	8		
42243	8		
LG051	26		
111923	26		
LG055	16		
107467	16		2

MS21920-28	Purchased	No		230	Each	84.0000	4	4
MS21920-28						**		CR 14-03-12
Clamp								

Location	Loc Qty	Loc Code	
FG	5		
105884	5		
LG050	79		
M127061	1		
M127544	11		
M127785	17		
M128129	50		4

MS21920-30	Purchased	No		230	Each	82.0000	2	2
MS21920-30						**		CR 14-03-12
Clamp								

Location	Loc Qty	Loc Code	
LG050	82		
m126336	34		2
m126453	48		

Picklist Print

February-19-14 12:59:41 PM

Work Order ID: 113513

113513

Parent Item: D412-664-203

D412-664-203

Parent Item Name: Aft Crosstube - High

Start Date: 2/19/14 **Required Date:** 3/05/14

Start Qty: 1.00 **Required Qty:** 1.00

AN6-40A	Purchased	No		250	Each	81.0000	4	4	
AN6-40A							**		DAS 32 9-89
Bolt									

Location	Loc Qty	Loc Code
ST340	6	
M126010	6	
ST504	75	
M127817	75	

DAS 31 9-89

M127817

AN6-41A	Purchased	No		250	Each	44.0000	2	2	
AN6-41A							**		DAS 32 9-89
Bolt									

Location	Loc Qty	Loc Code
ST340	44	
M126180	44	

DAS 31 9-89

M126180

MS21042L6	Purchased	No		250	Each	286.0000	6	6	
MS21042L6							**		DAS 32 9-89
Nut									

Location	Loc Qty	Loc Code
ST314	286	
m127304	10	
m127831	26	
m127904	250	

DAS 31 9-89

14/3/14 C

M127904

Picklist Print

February-19-14 12:59:41 PM

Work Order ID: 113513

113513

Parent Item: D412-664-203

D412-664-203

Parent Item Name: Aft Crosstube - High

Start Date: 2/19/14 **Required Date:** 3/05/14

Start Qty: 1.00 **Required Qty:** 1.00

NAS1149D0663J	Purchased	No		250	Each	2,252.000	18 - 18	DAS 32 9-89

NAS1149D0663J

Washer

DAS 31 9-89

Location		Loc Qty	Loc Code
ST294		11	
	123265	8	
	M126284	3	
ST510a		2241	
	M126334	699	
	M127813	842	M127813
	M127916	700	

DQA: _____ Date: _____

WORK ORDER NON-CONFORMANCE / UPDATE

DART AEROSPACE

QA Closed: Date: Work Order update only ☐

Work Order: _____

Part No. _____

NCR No. _____

DISPOSITION

Rework ☐
Scrap ☐
Use-as-is ☐
Suspected Unapproved ☐

AGAINST DEPARTMENT/PROCESS

Skid-tube ☐ Crosstube ☐ Water Jet ☐ Engineering ☐
Machining ☐ Small Fab ☐ Prod. Eng. Coor. ☐ Quality ☐
Thermoforming ☐ Finishing ☐ Rec/Store/Packaging ☐ Other ☐
Large Fab ☐ Composite ☐ Supplier ☐

Root Cause		Date	Step	Qty	Description of work order update or non-conformance	Initial Chief Eng	Action Description	Sign & Date	Verification	QC Inspector
Design	☐									
Doc/Data	☐									
Equip/Tooling	☐									
Handling/Pre	☐									
Material	☐									
Operator	☐									
Offset/Setup	☐									
Process	☐									
Supplier	☐									
Training	☐									
Transport	☐									
Unapproved	☐									

FAULT CATEGORY

Landing Gear

☐ Bending
☐ Centre Not Concentric
☐ Cracks
☐ Crimp/Kink/Ripple/Wave
☐ Cuffs
☐ Crushing
☐ Heat Treat
☐ Inspection Strip in Tube
☐ Marks/Chatter
☐ Turning Sequence
☐ Wave/Twist in Tube

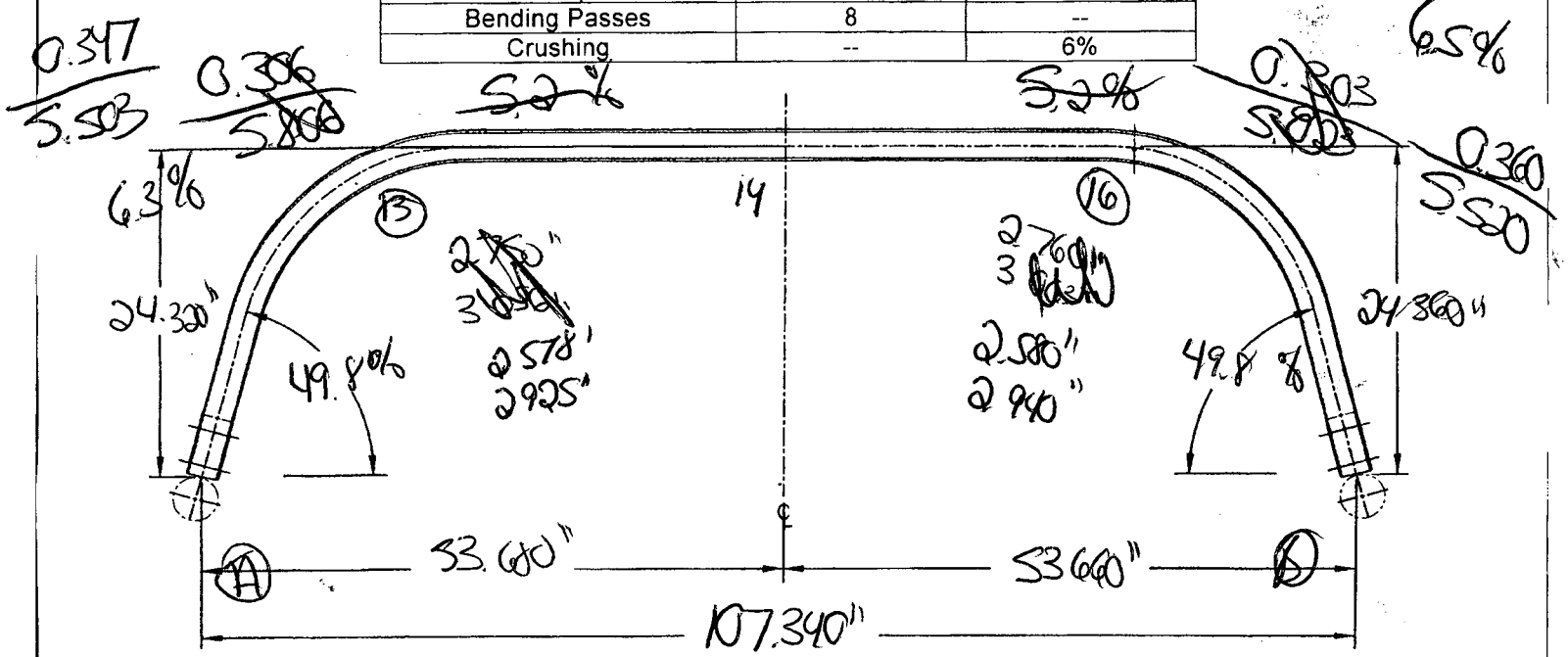
General

☐ Bend
☐ BOM/Route
☐ Broken/Damage/Defect
☐ Burrs
☐ Contamination
☐ Countersink
☐ Cut Too Short
☐ Drawing
☐ Drill Holes
☐ Finish
☐ Fit/Function
☐ Folio/Program
☐ Grain
☐ Hardware
☐ Inspection Incomplete/Unqualified
☐ Instructions Incomplete/Unclear
☐ Misaligned/off center
☐ Mislabeled
☐ Misread
☐ Off-set
☐ Out of Calibration
☐ Out of Sequence
☐ Outside Dimensions
☐ Over/Under tolerance
☐ Part Incorrect
☐ Part Lost/Missing
☐ Part Moved
☐ Positioned Wrong
☐ Power Loss/Surge
☐ Pressure/Forced
☐ Set-up
☐ Temperature/Cure
☐ Weld
☐ Wrong Stock Pulled
☐ Other

_____
_____
_____
_____

DART AEROSPACE LTD	Work Order:	113513
Description: Crosstube High Aft (412)	Part Number:	D412-664-203
Inspection Dwg: D412-664-243 **Rev:** E		Page 1 of 1

Required Dimension	Min	Max
Height	24.24	24.50
1/2 Span	53.59	53.85
Angle	49	52
Total Span	107.18	107.70
Bending Passes	8	--
Crushing	--	6%



	Side A	Side B
Bending Passes	13	16
Crushing	6.3%	6.5%
Comments		
Side A 13 passes crushing 6.3%		
middle 14 passes		
Side B 16 pass crushing 6.5%		

	DAS 27	DAS 16
QC15 Inspection	9-89	9-89
Date	14/2/24	14/02/25

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	07.05.08	Dimensions updated per Dwg rev. D	KJ/JLM	
C	10.02.02	Dwg Rev updated	KJ	
D	12.04.16	Added bending, crushing dimensions	KJ	

Item	Qty -243	Part Number	Description
1	X	D412-664-243	**CROSSTUBE ASSEMBLY (412 HIGH AFT)**
2	1	D6009-129	CROSSTUBE
3	2	D3595-063-570	RUBBER CUSHION
4	1	D2896-1	SUPPORT
5	2	D3189-1	CHAFING SHIELD
6	2	D2856-600-1009	ABRASION STRIP
7	4	MS21920-28	CLAMP
8	2	MS21920-30	CLAMP (OR MS21920-32)
9	A/R	MAGNOBOND 6398	ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE)

113513 MCS
14-02-19

② DEO'S ATTACHED

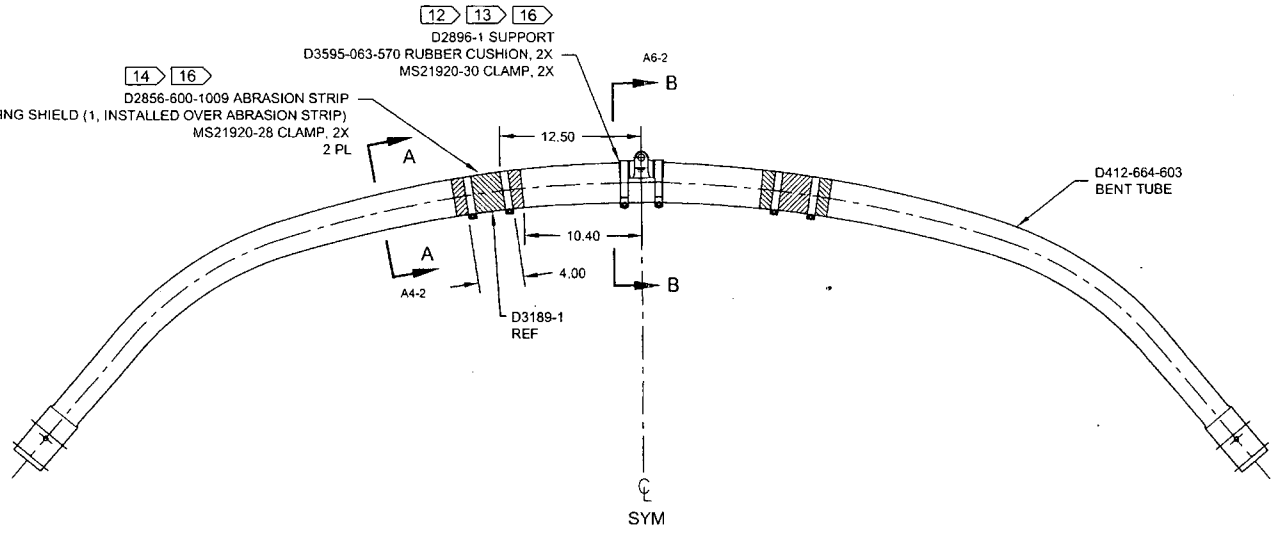
RELEASED D
2009 -10- 29

GENERAL NOTES:

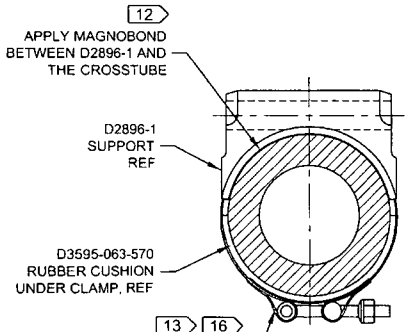
1) MATERIAL: MANUFACTURED FROM D6009-129
   FINISHED LENGTH = 124.100±0.020 (BEFORE BENDING/TRIMMING)
2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1
   PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
   PAINT OUTSIDE PER DART QSI 005 4.2
3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
4) UNITS: INCHES UNLESS OTHERWISE NOTED.
5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
6) IDENTIFICATION: SCRIBE DART PART NUMBER "D412-664-243" AND BATCH NUMBER ON INSIDE OF CUFF USING VIBRATING STYLUS.
7) WEIGHT: 47.0 lbs (PER IIN-D212-664)
8) PART IS SYMMETRIC ABOUT CENTERLINE.
9) RUN CUTTER OFF PART. BLEND OUT EDGE LONGITUDINALY, TRANSITION SHOULD BE SMOOTH.
10) BEND PROGRESSIVELY WITH A MINIMUM OF 8 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
11) LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038.
12) INSTALL D2896-1 SUPPORT USING 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF D2896-1 THAT WILL BE IN CONTACT WITH THE CROSSTUBE PER QSI 015. LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
13) INSTALL MS21920-30 CLAMPS (OR -32) WITH D3595-063-570 RUBBER CUSHIONS TO SECURE THE D2896-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE OPPOSITE OF CROSSTUBE SUPPORT.
14) INSTALL D2856-600-1009 ABRASION STRIPS WITH A 0.13 REF GAP ON BOTTOM SIDE OF CROSSTUBE PER QSI 035.
15) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.
16) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

REV.	DESCRIPTION	BY	DATE
E	REFORMAT/REVISE GENERAL NOTES; REORGANIZED VIEWS AND REFORMATTED DRAWING TO CURRENT STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A6-3); ADD TOLERANCE (ZN B6-3, C4-3, C8-3 & C5-3); MOVED TURNING DETAIL & UPDATED TOLERANCE TO SHEET 4.	RF	09.09.30
D	REMOVE D2732-058. CHANGE TO D3595-063-570	PH	07.03.09
C	REMOVE D2856-600-1087. ADD D2732-058 & MAGNOBOND 6398, MS21920-32 WAS MS21920-30	MB	06.10.27
B	ADD HOLES FOR COMPATABILITY WITH BHT/AA SKIDTUBES	PH	05.02.04
A	NEW ISSUE	PH	01.10.17

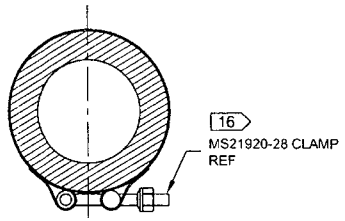
DESIGN	PH	**DART AEROSPACE LTD** HAWKESBURY, ONTARIO, CANADA	
DRAWN	RF		
CHECKED		DRAWING NO.	REV. E
MFG. APPR.		D412-664-243	SHEET 1 OF 4
APPROVED		TITLE	SCALE
DE APPR.		CROSSTUBE ASSEMBLY (412 HI AFT)	NTS
DATE	09.09.30		



D212-664-243
ASSEMBLY DETAIL E



SECTION B-B D4-2
SCALE 4X

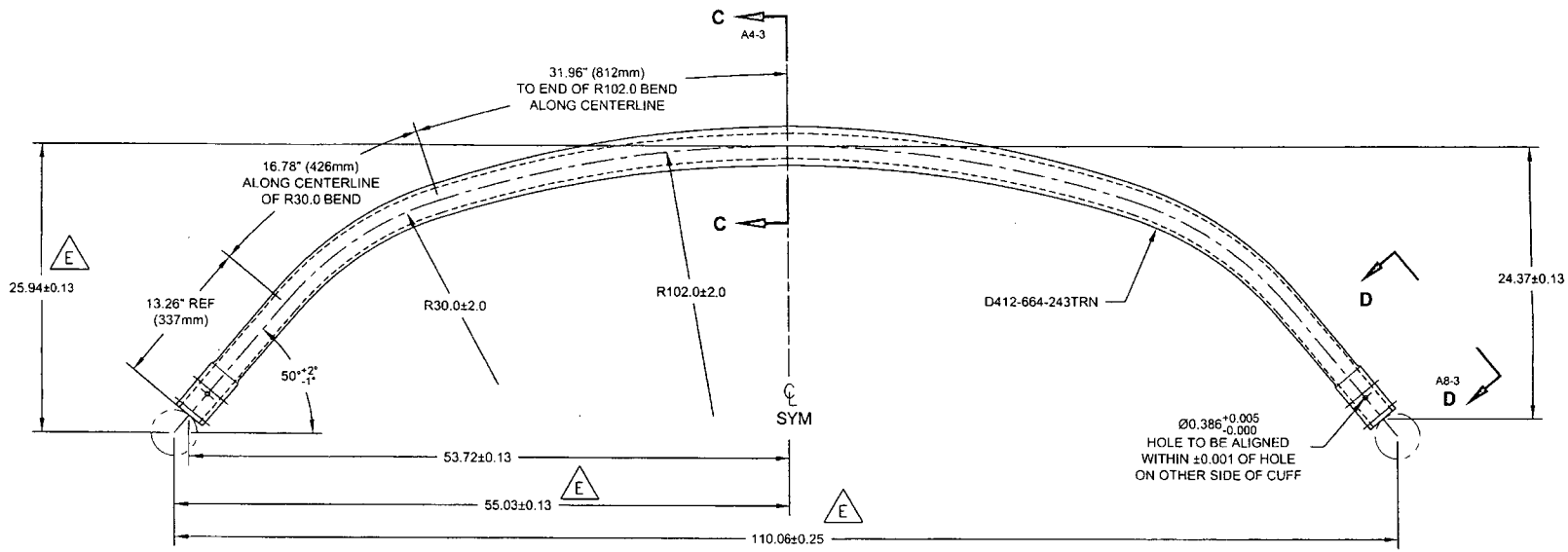


SECTION A-A C6-2
SCALE 4X

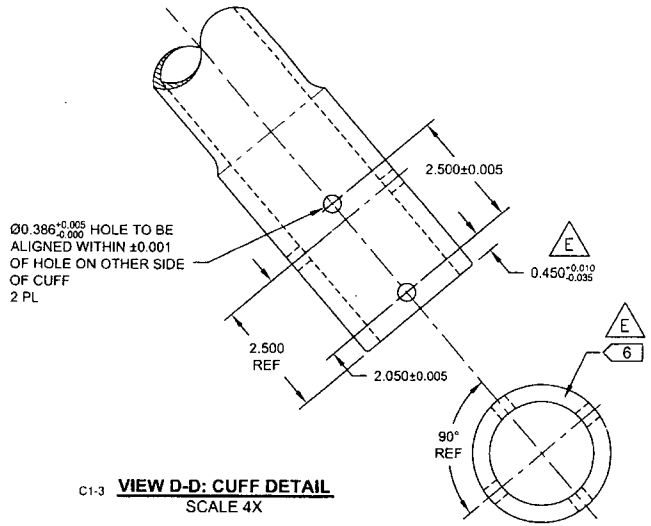
② DEO 15 ATTACHED

RELEASED
2009 -10- 29

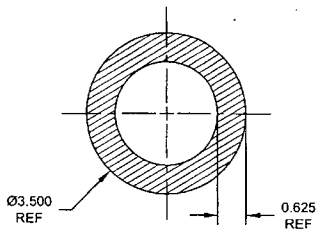
DESIGN	PH	**DART AEROSPACE LTD**	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
CHECKED		DRAWING NO.	REV. E
MFG. APPR.		D412-664-243	SHEET 2 OF 4
APPROVED		TITLE	SCALE
DE APPR.		CROSSTUBE ASSEMBLY (412 HI AFT)	NTS
DATE	09.09.30		



D412-664-603 10
BENDING AND DRILLING DETAIL E



C1-3 **VIEW D-D: CUFF DETAIL**
SCALE 4X

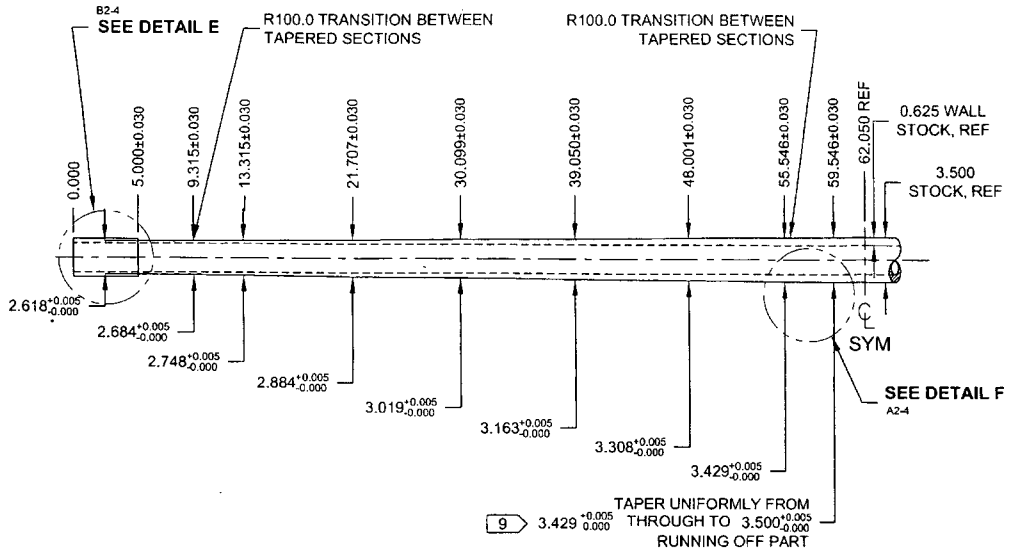


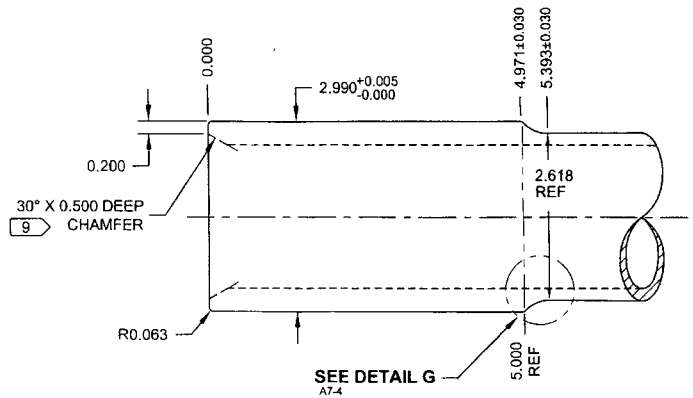
SECTION C-C D5-3
SCALE 4X

② DEO ATTACHED

RELEASED
2009 -10- 29

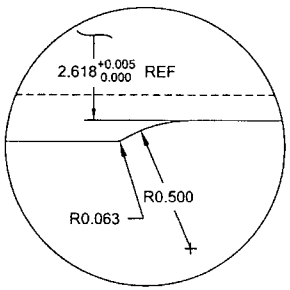
DESIGN	PH	**DART AEROSPACE LTD**	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
CHECKED		DRAWING NO.	REV. E
MFG. APPR.		D412-664-243	SHEET 3 OF 4
APPROVED		TITLE	SCALE
DE APPR.		CROSSTUBE ASSEMBLY (412 HI AFT)	NTS
DATE	09.09.30		



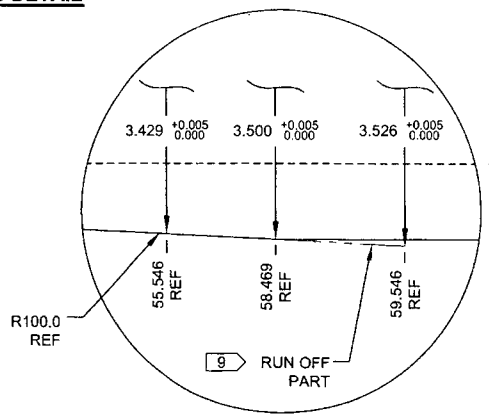


DETAIL E:
CROSSTUBE CUFF D8-4
SCALE 5X

D412-664-243TRN
TURNING DETAIL E



DETAIL G:
CUFF TRANSITION C2-4
SCALE 10X



DETAIL F:
TAPER RUN-OFF C4-4
NOT TO SCALE

(2) DEO ATTACHED

RELEASED
2009 -10- 29

DESIGN	PH	**DART AEROSPACE LTD**	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
CHECKED		DRAWING NO.	REV. E
MFG. APPR.		D412-664-243	SHEET 4 OF 4
APPROVED		TITLE	SCALE
DE APPR.		CROSSTUBE ASSEMBLY (412 HI AFT)	NTS
DATE	09.09.30		

DRAWING NO.	TITLE	REV. E	DART AEROSPACE LTD	D.E.O. NO.	SHEET NO.	SCALE
D412-664-243	CROSSTUBE ASS'Y (412 HI AFT)		ENGINEERING ORDER	D412-664-243-E-2	SHEET 1 OF 1	NTS

DRAWN	CHECKED	MFG. APPR.	APPROVED	DE APPR.
DATE 11.09.07	DATE 11.09.19	DATE 11.09.19	DATE 11.09.19	DATE 11.09.19

PURPOSE:
REPLACE MAGNOBOND WITH 3M DP460 SCOTCH-WELD EPOXY ADHESIVE

CHANGE:

IS:

Item	Qty -243	Part Number	Description
9	A/R	SCOTCH-WELD DP460	EPOXY ADHESIVE, 3M SCOTCH-WELD

WAS:

9	A/R	MAGNOBOND 6398	ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE)

NOTE 12 & 16, SHEET 1 IS AMENDED AS FOLLOWS:

IS:

12) INSTALL D2896-1 CENTER SUPPORT USING A 0.04" TO 0.07" THICK LAYER OF SCOTCH-WELD DP460 PER QSI 015. LET CURE FOR 24 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.

16) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING. **PRIOR TO PACKAGING, RE-CHECK TORQUE ON CLAMPS AFTER ADHESIVE HAS CURED FOR 24 HOURS.**

WAS:

12) INSTALL D2896-1 SUPPORT USING 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF D2896-1 THAT WILL BE IN CONTACT WITH THE CROSSTUBE PER QSI 015. LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.

16) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

RELEASED 2011-09-29

DQA: [illegible] Date: 14/05/24

QA Closed: [illegible] Date: 14-3-24

WORK ORDER NON-CONFORMANCE / UPDATE

DART AEROSPACE

Work Order update only ☐

Work Order: 163513

Part No. D412-664-263

NCR No. 14-3650

DISPOSITION

Rework	☐
Scrap	☐
Use-as-is	☒
Suspected Unapproved	☐

AGAINST DEPARTMENT/PROCESS

Skid-tube	☐	Crosstube	☒	Water Jet	☐
Machining	☐	Small Fab	☐	Prod. Eng. Coor.	☐
Thermoforming	☐	Finishing	☐	Rec/Store/Packaging	☐
Large Fab	☐	Composite	☐	Supplier	☐

Engineering	☐
Quality	☐
Other	☐

Root Cause		Date	Step	Qty	Description of work order update or non-conformance	Initial Chief Eng	Action Description	Sign & Date	Verification	QC Inspector
Design	☐	14/2/24	120	1	CRUSHING IS over tolerance.	DAS 12 9-89 14/2/24	Acceptable. Location is not critical.	DAS 12 9-89 14/2/24	DAS 27 9-89 14/2/25	~~DAS 27 9-89~~ 14/2/25 DAS 16 9-89
Doc/Data	☐									
Equip/Tooling	☐									
Handling/Pre	☐									
Material	☐									
Operator	☒									
Offset/Setup	☐									
Process	☒				RL: Bending Process		RL attached S.R.			
Supplier	☐									
Training	☐									
Transport	☐									
Unapproved	☐									

FAULT CATEGORY

Landing Gear

☒	Bending
☐	Centre Not Concentric
☐	Cracks
☐	Crimp/Kink/Ripple/Wave
☐	Cuffs
☒	Crushing
☐	Heat Treat
☐	Inspection Strip in Tube
☐	Marks/Chatter
☐	Turning Sequence
☐	Wave/Twist in Tube

General

☐	Bend
☐	BOM/Route
☐	Broken/Damage/Defect
☐	Burrs
☐	Contamination
☐	Countersink
☐	Cut Too Short
☐	Drawing
☐	Drill Holes
☐	Finish
☐	Fit/Function

☐	Folio/Program
☐	Grain
☐	Hardware
☐	Inspection Incomplete/Unqualified
☐	Instructions Incomplete/Unclear
☐	Misaligned/off center
☐	Mislabeled
☐	Misread
☐	Off-set
☐	Out of Calibration
☐	Out of Sequence

☐	Outside Dimensions
☐	Over/Under tolerance
☐	Part Incorrect
☐	Part Lost/Missing
☐	Part Moved
☐	Positioned Wrong
☐	Power Loss/Surge

☐	Pressure/Forced
☐	Set-up
☐	Temperature/Cure
☐	Weld
☐	Wrong Stock Pulled
☐	Other

ACUREN

LIQUID PENETRANT TEST REPORT

P- 12269

PAGE 1 OF 1

CLIENT	Dart Aerospace	DATE	March 6 2014 TIME AM ☑ PM ☐
ATTENTION	Chantale, Linda	ACUREN JOB NO.	188-14-C0208
ADDRESS	1270 Aberdeen St Hawkesbury, on	PO/WO NO.	32259
		WORK LOCATION	As Address
		ACCEPTANCE STD.	Asme 1418 / asme 138 REV./DATE 2005
PROJECT	PT - wet Fluorescent Liquid penetrant Inspection		
ITEM(S) EXAMINED	- See below		

JOB DESCRIPTION	PROCEDURE NO. LT-~~200~~ REV./DATE 2009	TECHNIQUE NO. LT-~~200~~ XXX REV./DATE 2009
PART NO.	MATERIAL Aluminium	THICKNESS N/A
SCOPE	Performed a Wet Fluo L.P.I on 100% of the external surface only on Items mentionned below.	

TEST DETAILS

METHOD	☑ FLUORESCENT ☐ VISIBLE			☑ WATER WASH	☐ SOLVENT REMOVABLE ☐ POST EMULSIFIED
FAMILY BRAND	MagnaFlux			BLACK LIGHT S/N 13790	☐ OUTPUT > 1000 µ W/CM² ☐ AMBIENT < 2 fc
PENETRANT	ZL-67	MINIMUM DWELL TIME	~~15~~ MIN.	LIGHTING EQUIP.	☐ FLASHLIGHT ☐ TROUBLELIGHT ☐ OUTPUT>100 fc @ SURFACE
PENETRANT REMOVER	#20	MINIMUM DRY TIME	>10 MIN.	OTHER	
DEVELOPER	SKD S2	MINIMUM DWELL TIME	~~30~~ MIN.	LIGHT METER S/N 10988866	CAL DUE DATE ~~May~~ 2014
DEVELOPER TYPE	☑ NON AQUEOUS ☐ AQUEOUS	☐ DRY			

TEST SURFACE

SURFACE CONDITION	☐ AS GROUND	☐ AS WELDED	☑ MACHINED	☐ SHOT BLASTED	☐ CLEAN BARE METAL
SURFACE TEMPERATURE	☐ < - 4°C/ 20°F	☐ - 4°C/ 20°F TO 10°C/50°F		☑ 10°C/50°F TO 52°C/125°F	☐ > 52°C/125°F

RESULTS- (☐ METRIC ☐ IMPERIAL)

	COMMENTS	ACCEPT	REJECT	
1	AFT crosstube High W.O ID 110940	✓		Item I.D 0412-664-203
2	AFT crosstube-High WO ID 110941	✓		Item I.D 0412-664-203
3	Fwd crosstube-High WO ID 111321	✓		Item I.D 0212-664-101
4	Fwd crosstube-High W.O I.D 111322	✓		Item I.D 0212-664-101
5	Fwd crosstube-High WO I.D 111323	✓		Item I.D 0212-664-101
6	Fwd crosstube-High W.O I.D 111324	✓		Item I.D 0212-664-101
7	AFT crosstube-High W.O I.D 111313	✓		Item I.D 0412-664-203

No Relevant Indication was detected As per Applicable Standard at the time of Inspection.

Scope of Services

The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressly understood that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as representations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as a result of the data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.

Standard of Care

In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Acuren Group Inc.

SIGNATURES

CLIENT REPRESENTATIVE	Christopher Renaud (PRINT)	Christopher Renaud (SIGNATURE)	DTR # E-07964
TECHNICIAN (SIGNATURE):			REPORT REVIEWED BY:
NAME (PRINT):	Alexandre Menard (1ST TECHNICIAN)	(2ND TECHNICIAN)	NAME / INITIALS
	CGSB LEVEL 2 SNT LEVEL 2	CGSB LEVEL ____ SNT LEVEL ____	
	CGSB REG. NO 10148	CGSB REG. NO	

WHITE – CLIENT COPY CANARY – OFFICE COPY PINK – TECHNICIAN COPY GOLD – OFFICE COPY

Work Order ID 113513

113513

February-19-14 12:59:35 PM

Item ID: D412-664-203

Accept *N9000040100*

Setup Start *NS1*

Stop *NS2*

Revision ID:

Item Name: Aft Crosstube - High

Start Date: 2/19/14 **Start Qty:** 1.00 *1*

Required Date: 3/05/14 **Req'd Qty:** 1.00 *1*

Cust Item ID:

Customer:

Reference:

Run Start *NR1*

Stop *NR2*

Approvals: **Process Plan:** MLS **Date:** 14-02-19 **Tooling:** **Date:**

QC: **Date:** **SPC (Y/N):** **Date:**

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
Draw Nbr	**Revision Nbr**								
D412-664-243	E/DEO								
100	DOCUMENT CONTROL	0.00							
100		0.00							
DC	**Memo**								
Doc.Control -USB or Paperwork	Photocopy bluefile and create labels as per PPP D412-664-203 CHG 009								
110	Packaging	0.00							
110		0.00							
Packaging	**Memo**								
Packaging									
120	BENDING MACHINE - CROSSTUBES	0.00							
120		0.00							
CNC Bend 2	**Memo**								
CNC Alpha 160 Bender	Bend tube as per Dwg D412-664-243 using CNC bender program 412-aft and Folio FT010								

MLS 14-03-18

MD 14/02/19

MD 14/02/24

Size Attached Sheet

Pb →
Last Page

DRAWING NO.	TITLE	REV.	DART AEROSPACE LTD	D.E.O. NO.	SHEET NO.	SCALE
D412-664-243	CROSSTUBE ASSEMBLY (412 HI AFT)	E	ENGINEERING ORDER	D412-664-243-E-4	SHEET 1 OF 3	NTS

DRAWN	CHECKED	MFG. APPR.	APPROVED	DE APPR.
DATE 12.08.21	DATE 12.08.30	DATE 12.08.30	DATE 12/8/30	DATE 12.08-30

PURPOSE:
REMOVED ABRASION STRIP IN FAVOR OF A THIN LAYER OF PROSEAL 890. UPDATE INSTALLATION OF CHAFING SHIELDS AND REDUCE TORQUE TO 40-50 IN-LBS. THIS ENGINEERING ORDER SUPERCEDES DEO D412-664-243-E-1.

CHANGE:

PARTS LIST IS AMENDED AS FOLLOWS:

IS:

Item	Qty -243	Part Number	Description
~~6~~	~~0~~	~~D2856-600-1009~~	~~ABRASION STRIP~~

WAS:

6	2	D2856-600-1009	ABRASION STRIP

NOTES 2, 14, AND 16 ON SHEET 1 ARE AMENDED AS FOLLOWS:

IS:

2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
MASK UNDERSIDE OF CROSSTUBE AS SHOWN (HATCHED AREA)
PAINT OUTSIDE PER DART QSI 005 4.2
AFTER PAINTING, APPLY CLEAR COAT ON HATCHED AREA

14) APPLY A THIN COAT OF PROSEAL 890 ON INSIDE CONCAVE SURFACE OF D3189-1 CHAFING SHIELD AND LET CURE PER MANUFACTURER'S INSTRUCTIONS. INSTALL PROSEALED D3189-1 CHAFING SHIELD ONTO CROSSTUBE BY APPLYING A THIN COAT OF PROSEAL 890 ONTO CROSSTUBE. BE SURE TO ELIMINATE ANY AIR GAPS.

16) TORQUE CLAMPS ON D2896-1 SUPPORT 80 TO 100 IN-LB. **TORQUE CLAMPS ON D3189-1 CHAFING SHIELD 40 TO 50 IN-LB.** ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

WAS:

2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART QSI 005 4.2

14) INSTALL D2856-600-1009 ABRASION STRIPS WITH A 0.13 REF GAP ON BOTTOM SIDE OF CROSSTUBE PER QSI 035.

16) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

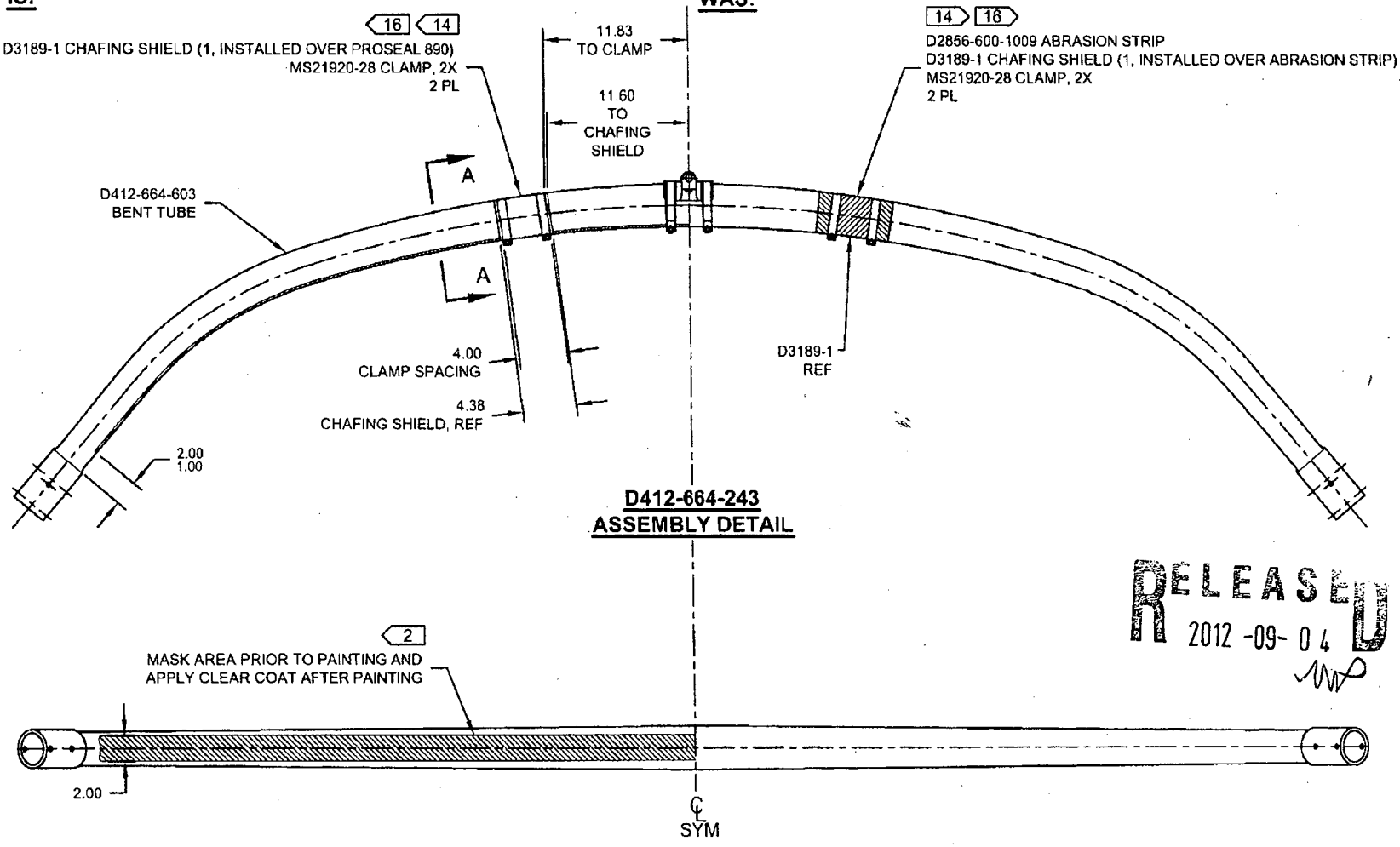
RELEASED
2012 -09- 04

DRAWING NO.	TITLE	REV. E	DART AEROSPACE LTD	D.E.O. NO.	SHEET NO.	SCALE
D412-664-243	CROSSTUBE ASSEMBLY (412 HI AFT)		ENGINEERING ORDER	D412-664-243-E-4	SHEET 2 OF 3	NTS

DRAWN	CHECKED	MFG. APPR.	APPROVED	DE APPR.
DATE 12.08.21	DATE 12.08.27	DATE 12.08.29	DATE 12.08.29	DATE 12.08.29

IS:

WAS:

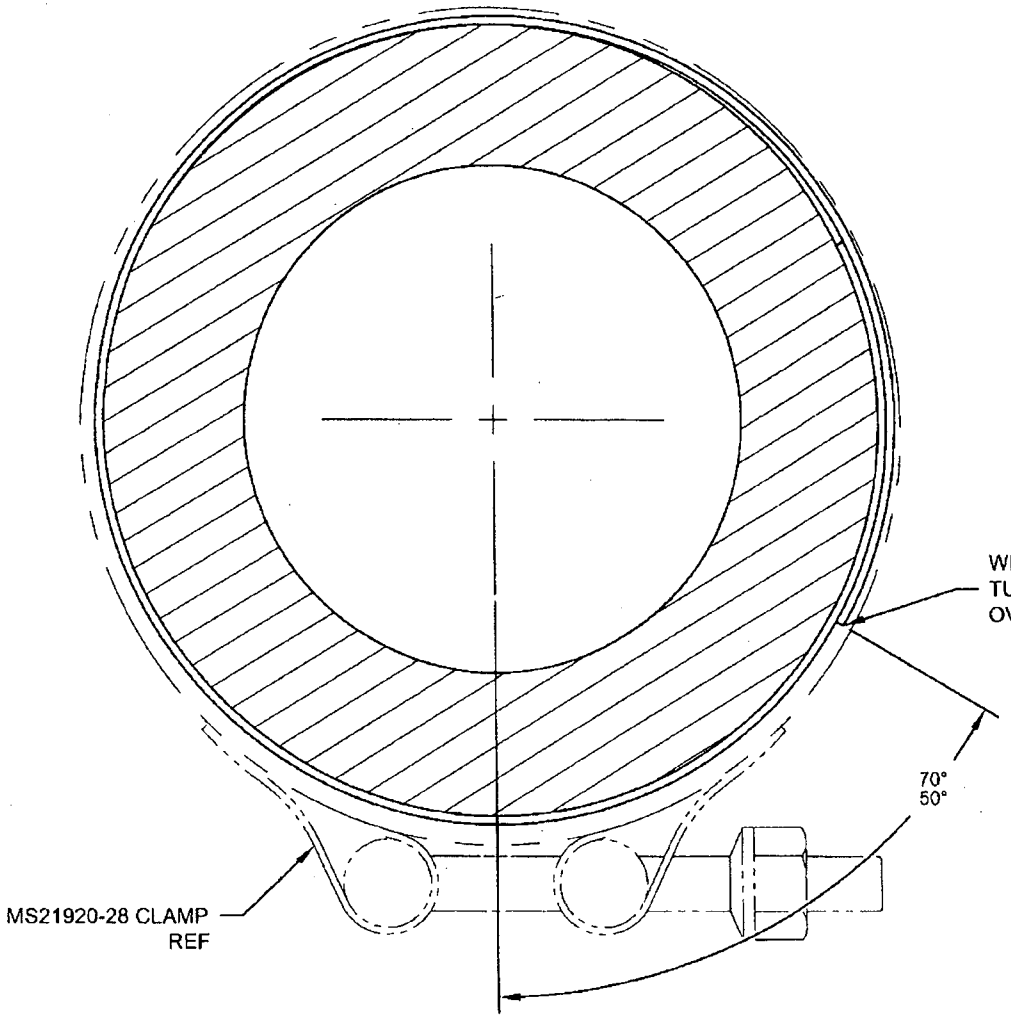


D412-664-243
ASSEMBLY DETAIL

RELEASED
2012 -09- 04

DRAWING NO.	TITLE	REV.	DART AEROSPACE LTD	D.E.O. NO.	SHEET NO.	SCALE
D412-664-243	CROSSTUBE ASSEMBLY (412 HI AFT)	E	ENGINEERING ORDER	D412-664-243-E-4	SHEET 3 OF 3	NTS

DRAWN	CHECKED	MFG. APPR.	APPROVED	DE APPR.
DATE 12.08.21	DATE 12.08.27	DATE 12.08.29	DATE 12.08.29	DATE 12.08.29



RELEASED
2012 -09- 04

SECTION A-A
CHAFING SHIELD DETAIL
VIEW ROTATED, NOT TO SCALE

412-664-203 Crosstube

BATCH:

Setup:

3.5" rollers for middle bend
-side bends use 3.375 rollers

B113513

*******MAKE SURE TOWERS ARE AT CORRECT HEIGHT BEFORE DOING INITIAL APPROACH*****

Lines:
29" & 32" from Centerline & 22.25" from cuffs.

3.5 Rollers

2900 | 2900

Middle Bend

(buggy A 1.75" on cuff)
3.5" Rollers.run prog (odd#'s) M1-3-5-7-9-11-13 CHECK. Run 14,15,16 **AS REQUIRED**, to bend middle. Bend both tubes of Kanban before changing rollers to 3.375"
Approach is **2900** on both rollers, starting @ 32" line on tube with longer end of tube on **LARGE TABLE.**
NOTE: Check middle bend on the board that is down (not bender table board),reference lines **MUST** match up with tangent lines if not the side bends will not work properly.(Hand made ref. line on board 412)

3730 | 1820

Side bends

(buggy A 1.75" on cuff) **LARGE TABLE**

3.375 Rollers

After changing rollers, start program run 412-side 1 to 5 from 29"line. **Y @ 1820 & W @ 3730** approaches for program 10 (up tapper sets itself automatically on 22.25 line. Run program 10 and 12 up taper, repeat on second side then check. must reset approaches for each up taper program from this point on. **Y3500 W3730.**
Run additional programs as required to finish tube.

3730 | 3500

NOTES

-12/3/1 working with middlefix program to even out sides. after completely running middle programs, (up to 15) ran middlefix program with under bent side on large table, from centre line. we had a difference of about .100" between the two sides before running. afterwards we had two perfect matching measurements for middle bend. approach for middle program was **W2855/3095Y**.

-13/01/24... middle bend (1,3,5,7,9,11,13).....sides 1,2,3,4,5,10,12 CHECK ..run 14,16,18 etc. as needed checking between each program! MO

PASSES:

A 1 2 3 4 5 10 12 11 16 18 19 20

13

AT 3 5 7 9 11 13

14

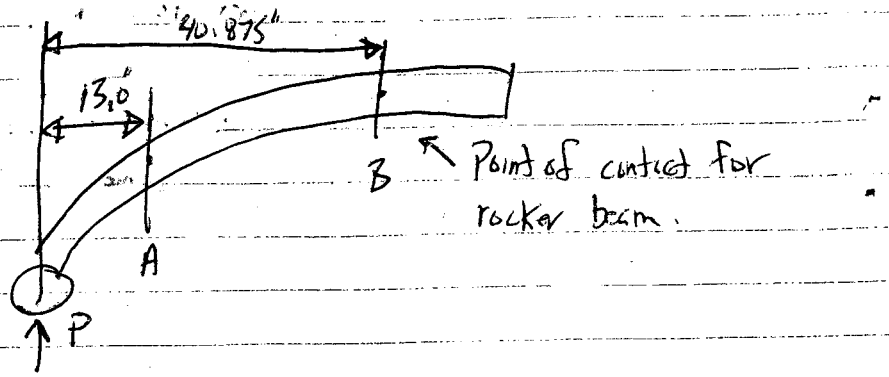
1 2 3 4 5 10 12 11 16 18 19 20

21 21 22 23

11.12.06

CRUSHING OF D412-664-243

Acceptability of 8% CRUSHING AT END OF BEND



POINT A: $OD_1 = 2.961"$, $OD_2 = 2.522"$

CRUSHING = $(2.961-2.522)/(2.961+2.522) = 8\%$

$I = 1.676\ in^4$ (from AutoCAD)

POINT B: $OD_1 = 3.307"$, $I = 4.613\ in^4$

A: $F = Mc/I = P \times 13 \times 2.961 / 2 \times 1.676 = 11.484 \cdot P$

B: " $= P \times 40.875 \times 3.307 / 2 \times 4.613 = 14.651 \cdot P$

M.S. $= 14.651/11.484 - 1 = 0.27$

∴ Tube will break at rocker beam contact before area of 8% crushing, 8% crushing in area at end of tube bend is acceptable

11.12.06